It's All Connected:

How Stormwater Ponds Impact the Coast

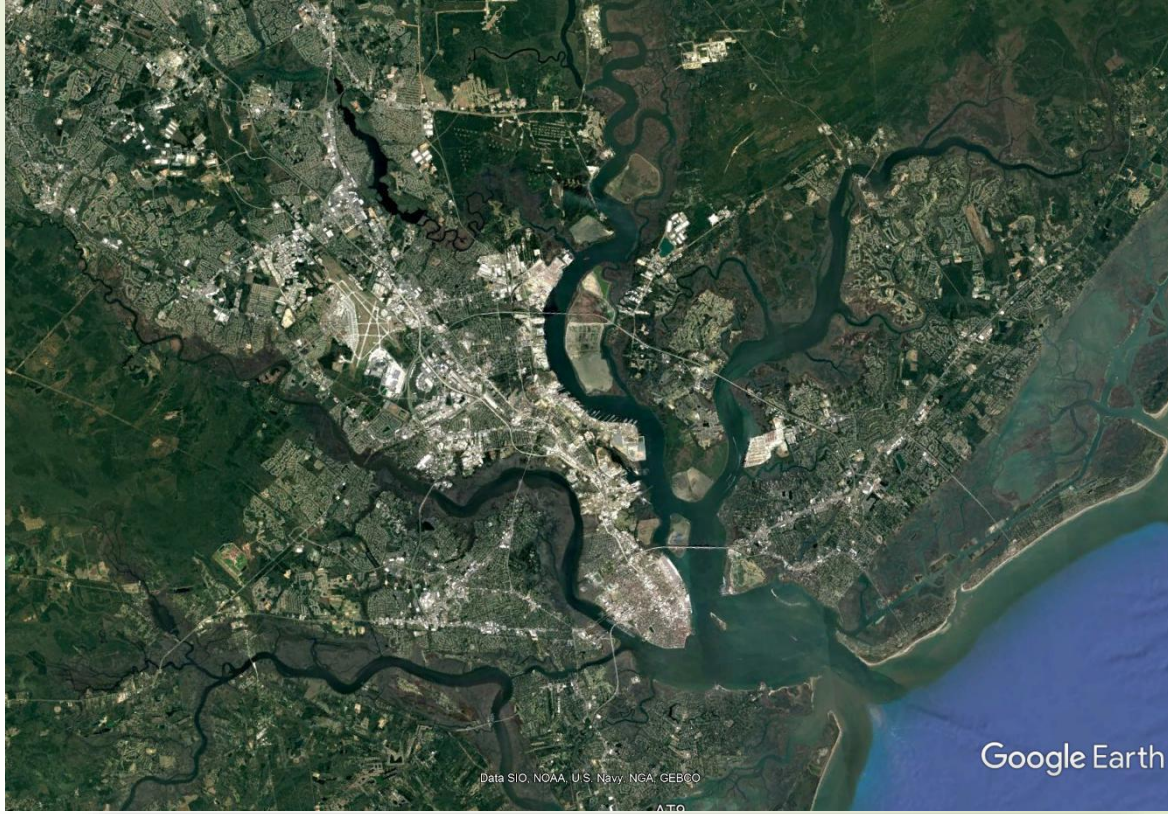
Denise Sanger

SC Department of Natural Resources

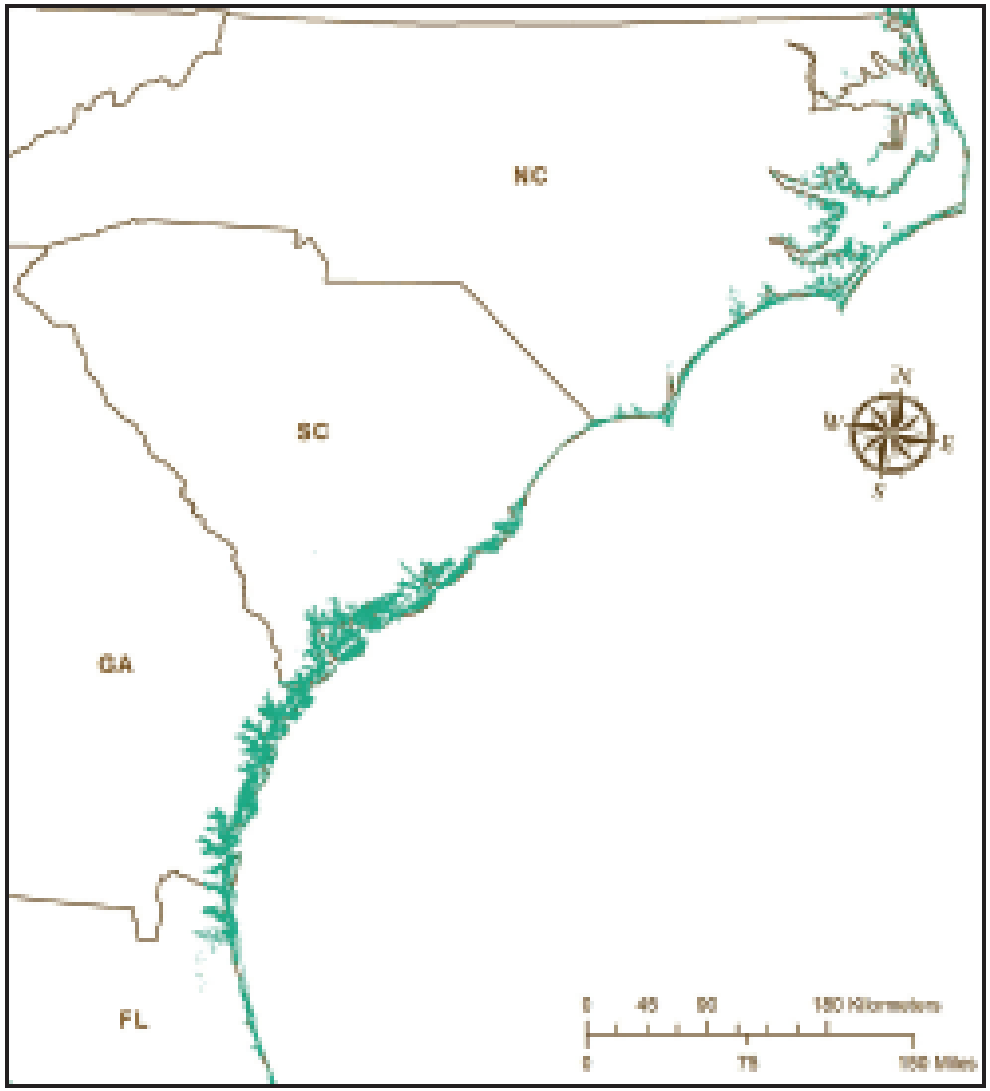
ACE Basin National Estuarine Research Reserve (NERR)

Coast

- Estuarine ecosystems
  - Focus on salt marshes and tidal creeks
- Brackish to marine
- Semi-diurnal tides
  - 3-9 ft in SC



Ecological Value



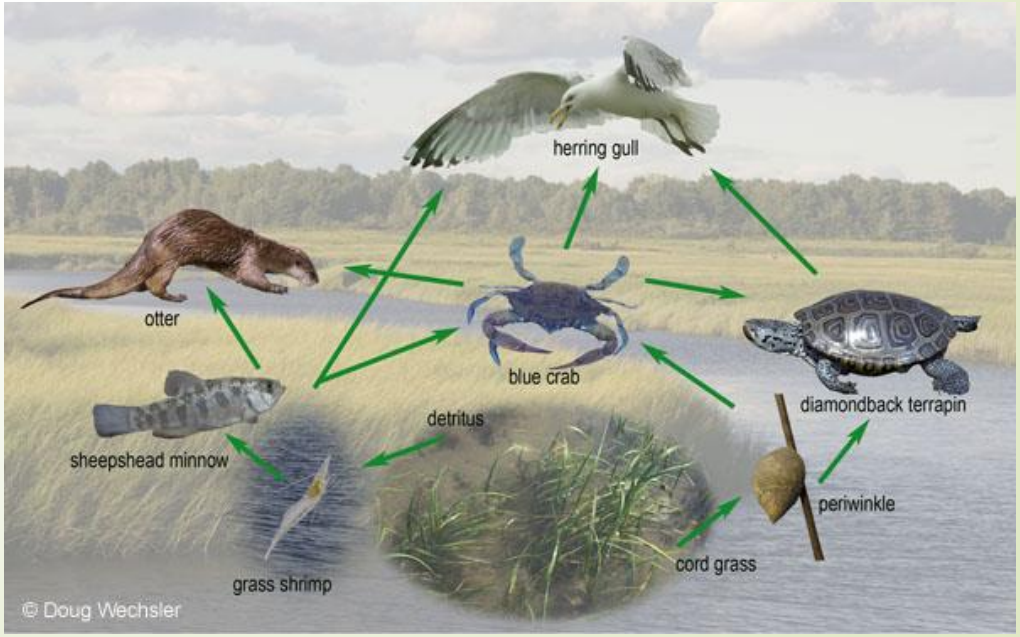
- Prevalent in the Southeast
  - 1M, ~350,000 SC
- Productive and biologically diverse
- Nursery habitat and feeding grounds
  - Fish, shrimp, crabs, birds
- Critical habitat
- Naturally variable and complex ecosystems

Economic Value

- Pollution filtration
- Water quality
- Seafood production
- Protection from coastal storms
- Coastal erosion protection
- Conduits for stormwater runoff to estuaries
- People enjoy their natural beauty and bounty
  - Recreationally
  - Culturally

Feeding Grounds and Nursery Habitat

- Second most productive ecosystem on the planet.
- Over 75% of commercially important species in the SE use during some portion of life cycle.

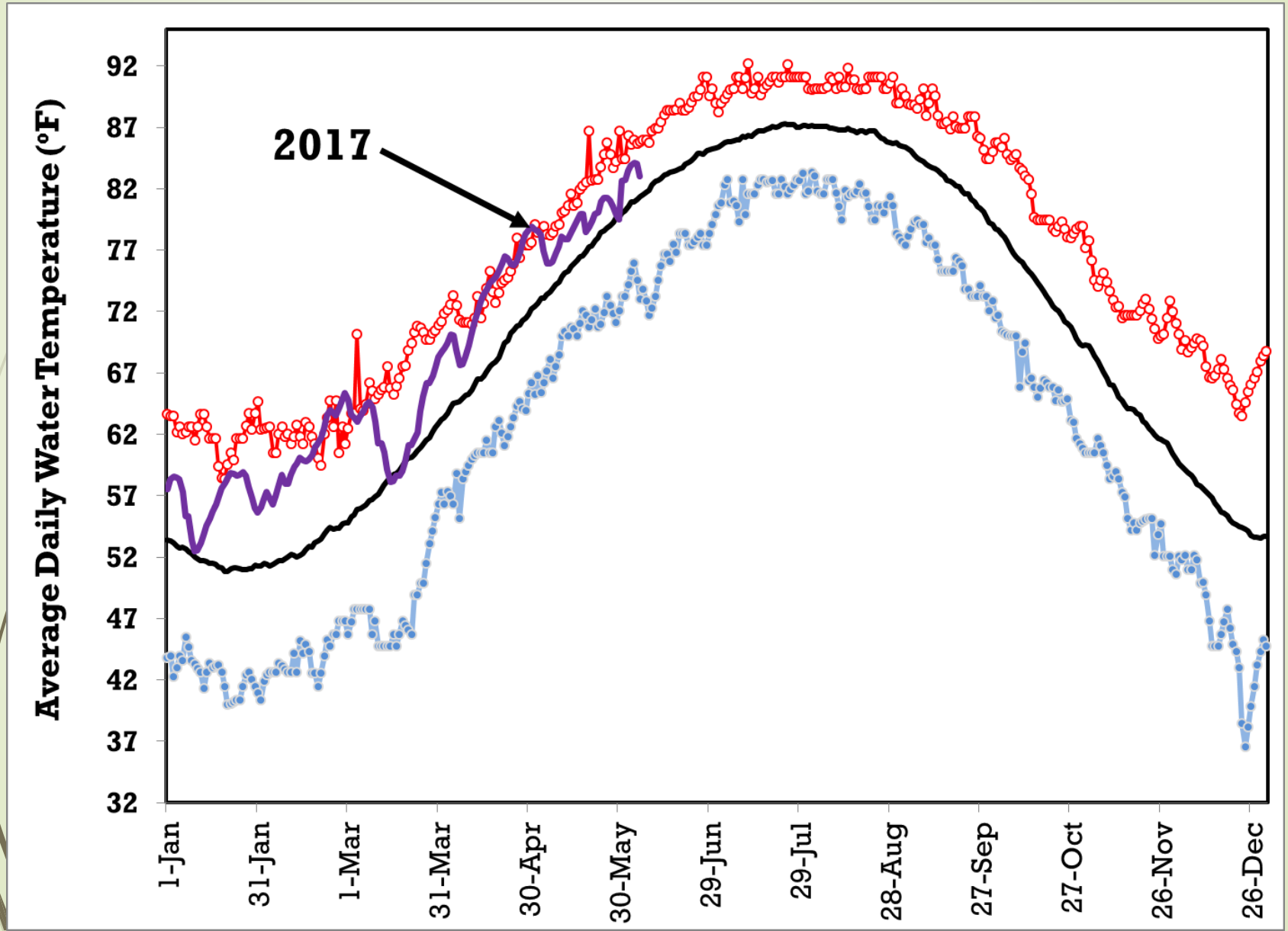


Animals that live in Estuaries

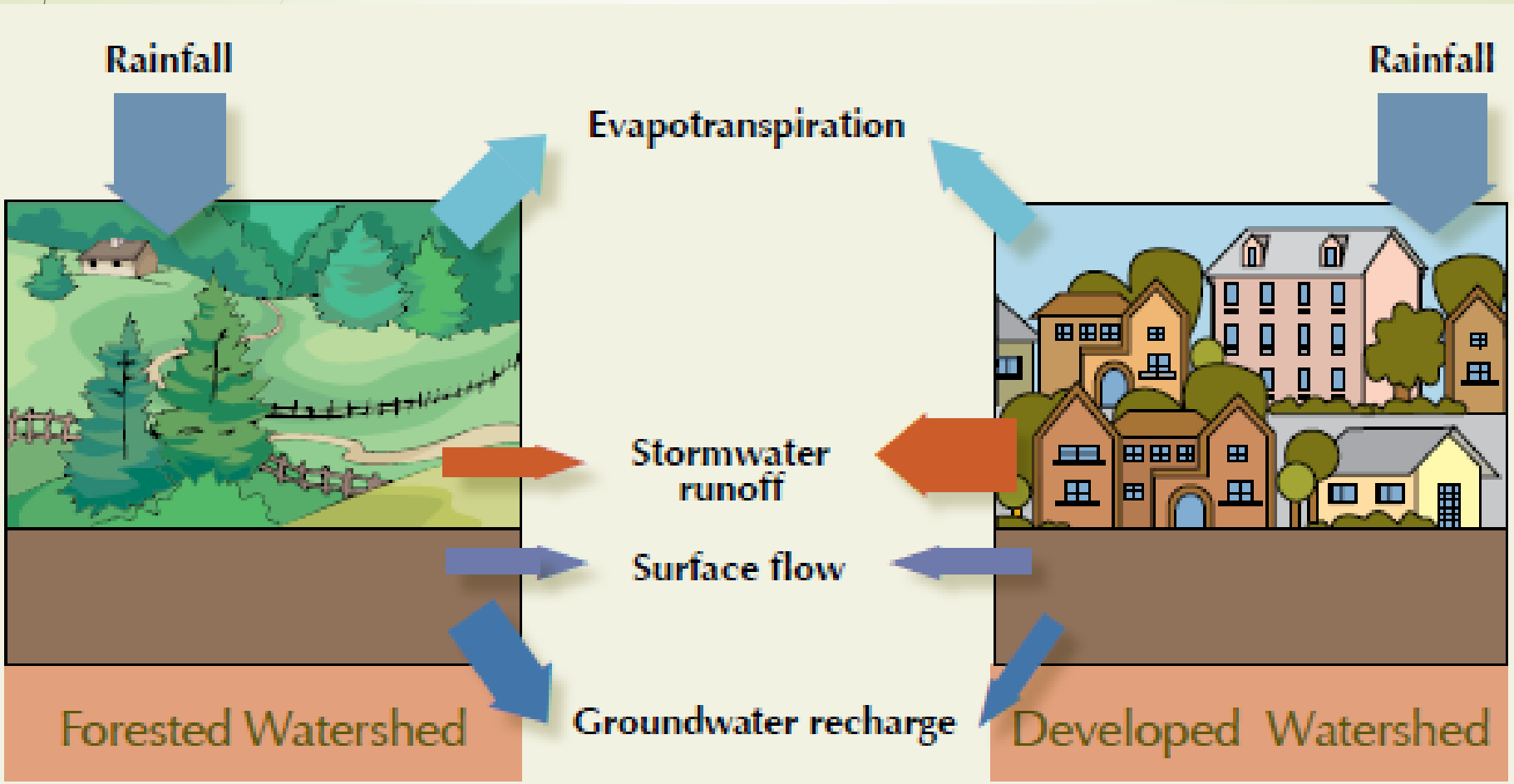
Challenges for us

- Natural variability
- Weather is changing
- Land use impacts on our environment
- Runoff changes with development and weather changes
- Sea level rise

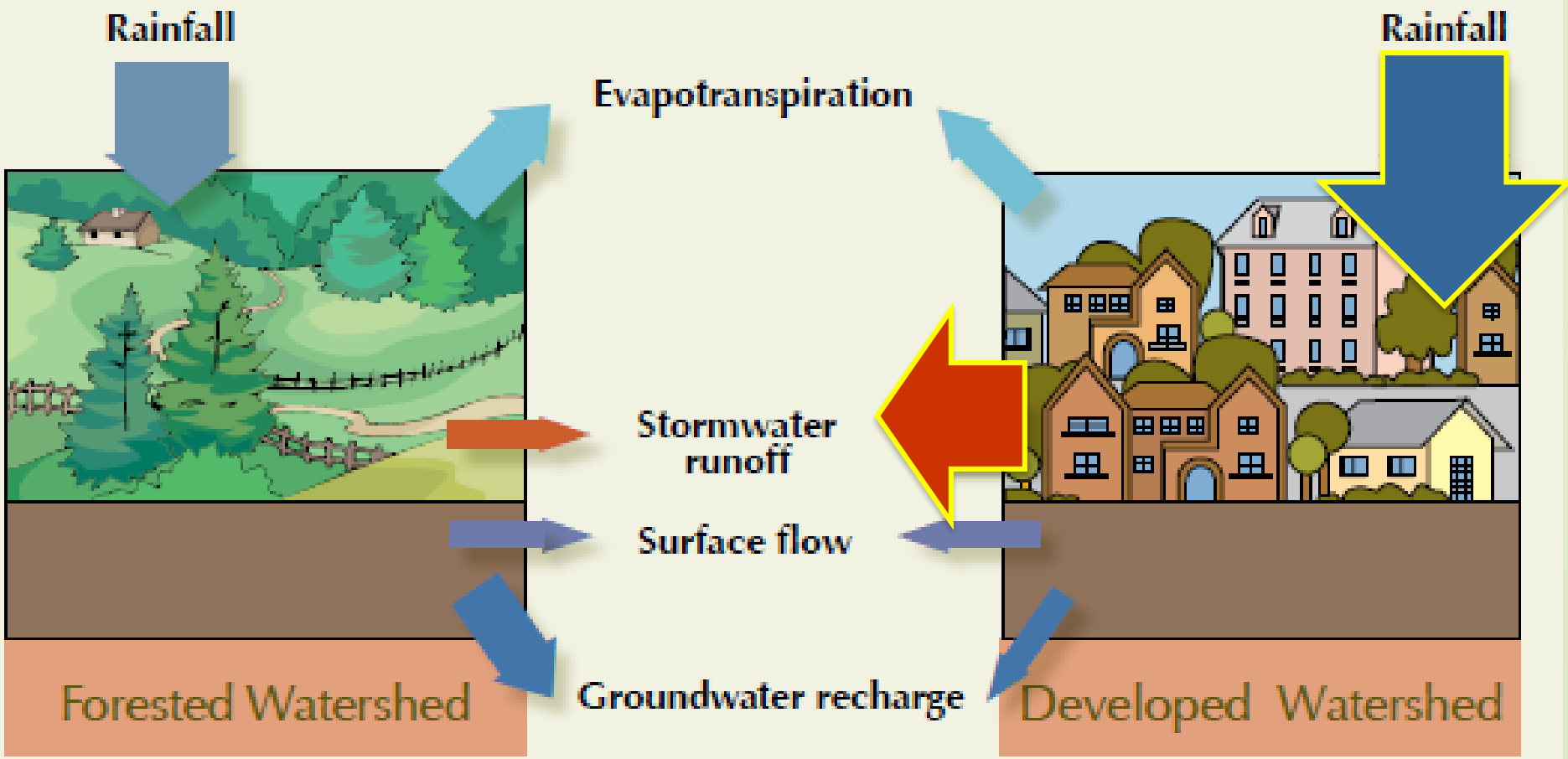
Changing Weather



Coastal Development

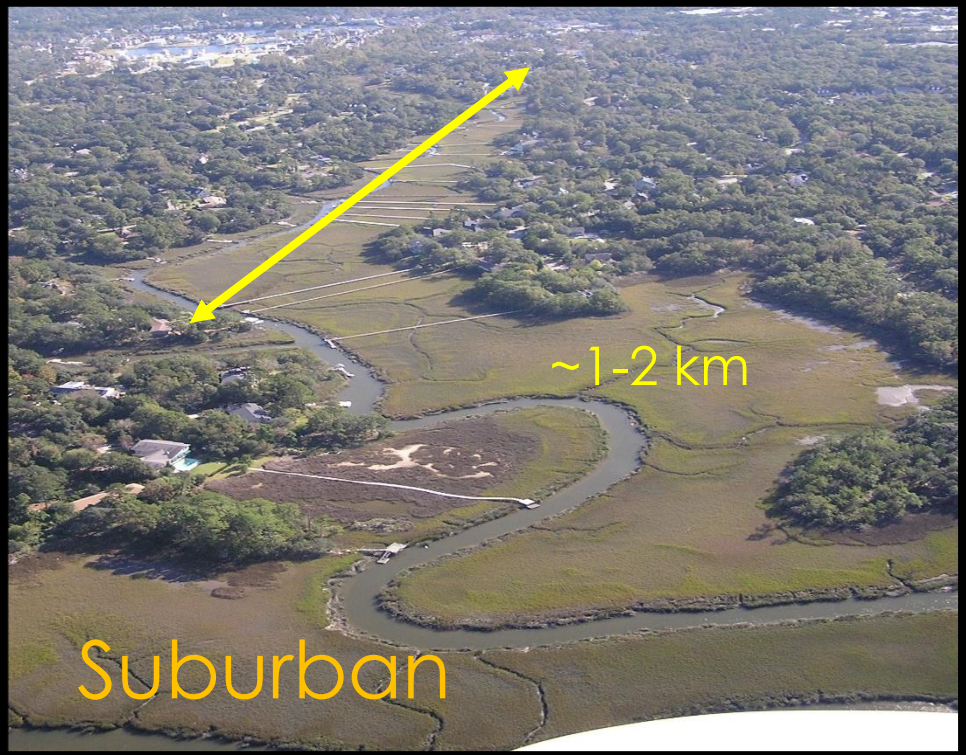


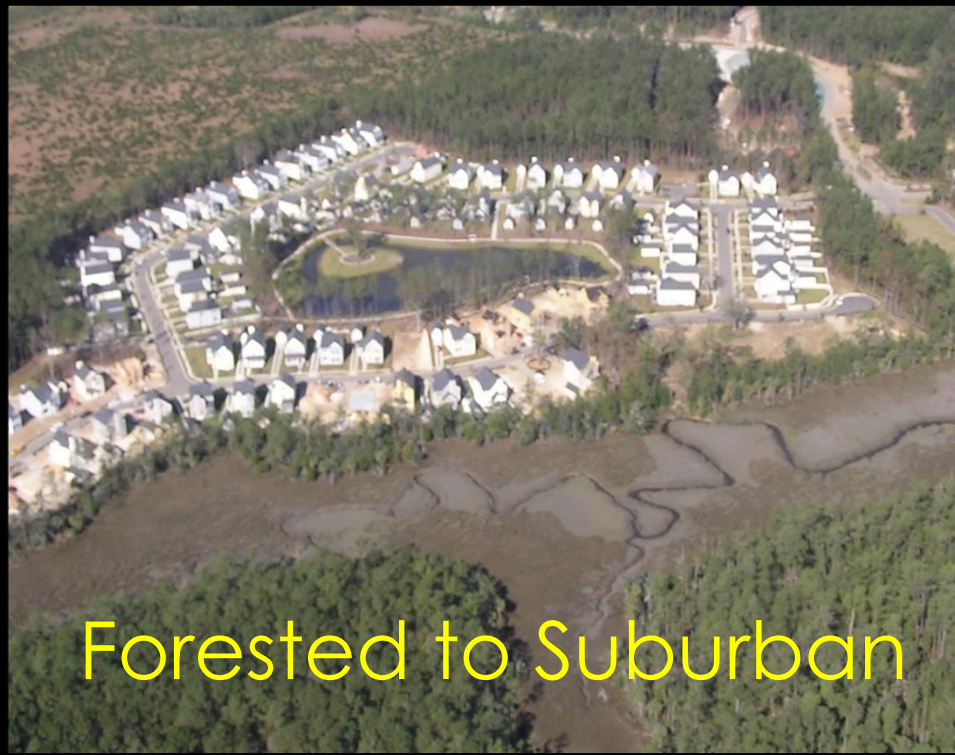
Runoff changes with development and weather changes.



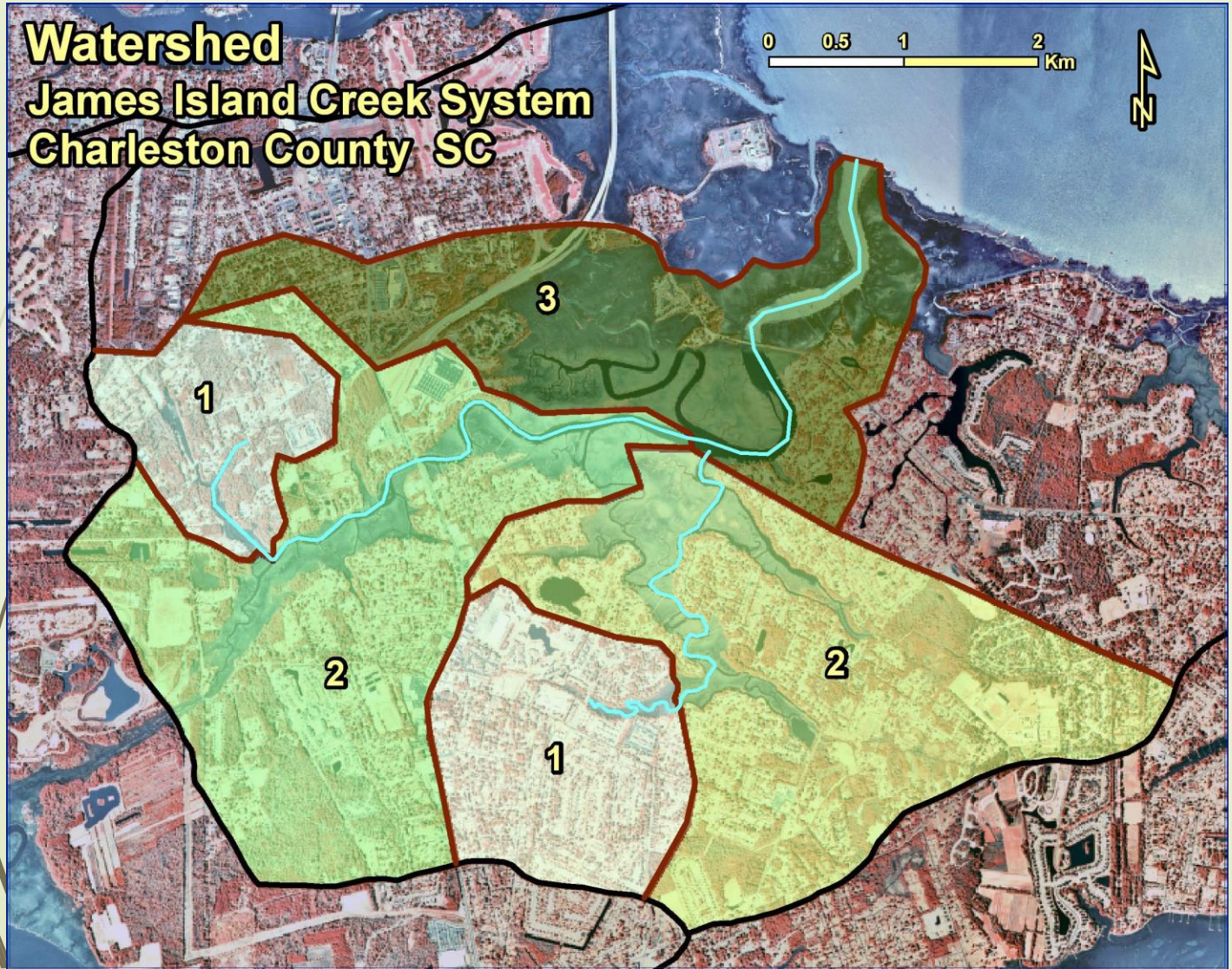

~1-2 km
Forested

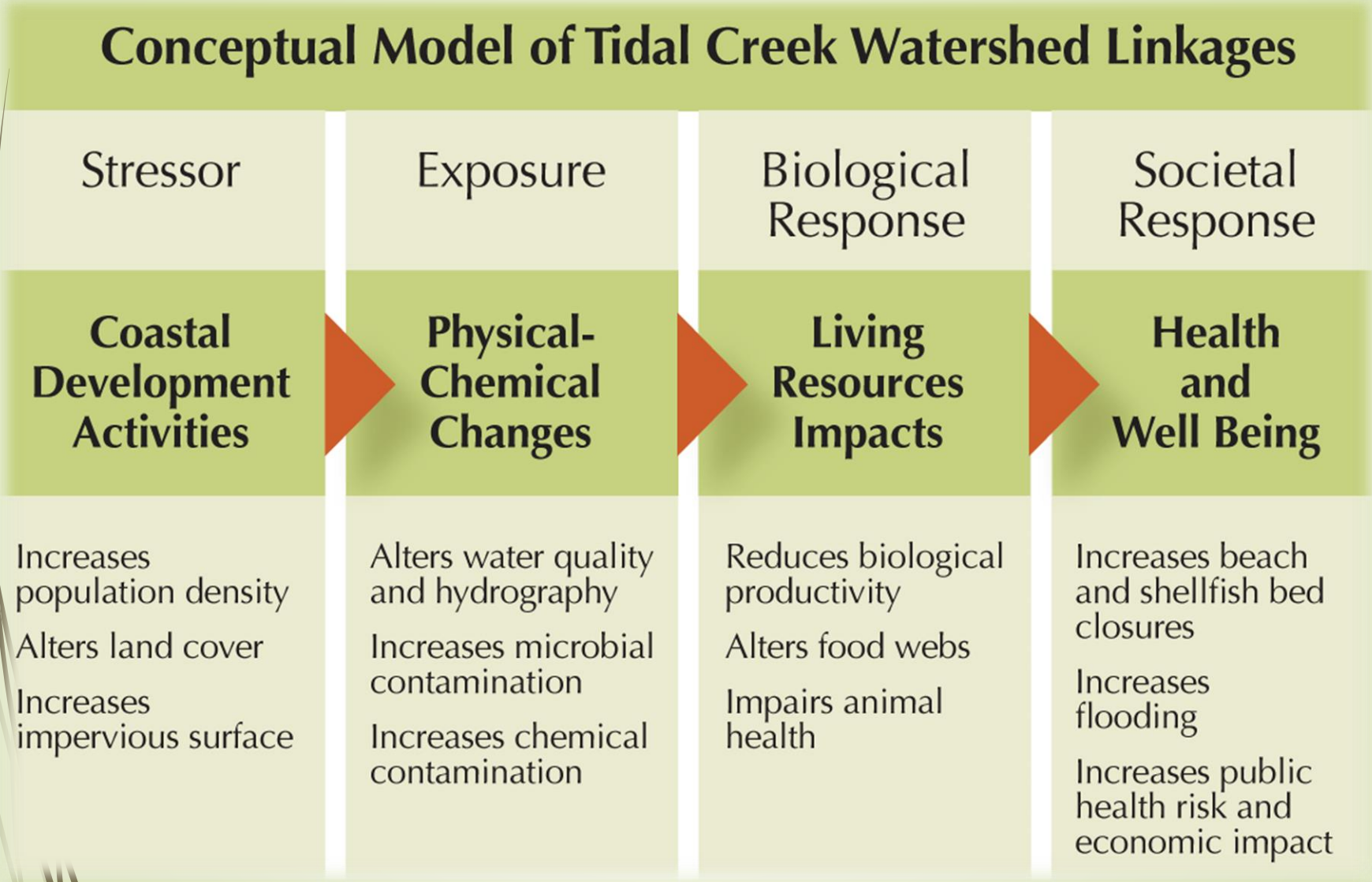

Urban


~1-2 km
Suburban


Forested to Suburban

Understanding watersheds is critical.




Conceptual Model of Tidal Creek Watershed Linkages
Stressor
Exposure
Biological Response
Societal Response
Coastal Development Activities
Physical-Chemical Changes
Living Resources Impacts
Health and Well Being
Increases population density
Alters land cover
Increases impervious surface
Alters water quality and hydrography
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Increases flooding
Increases public health risk and economic impact

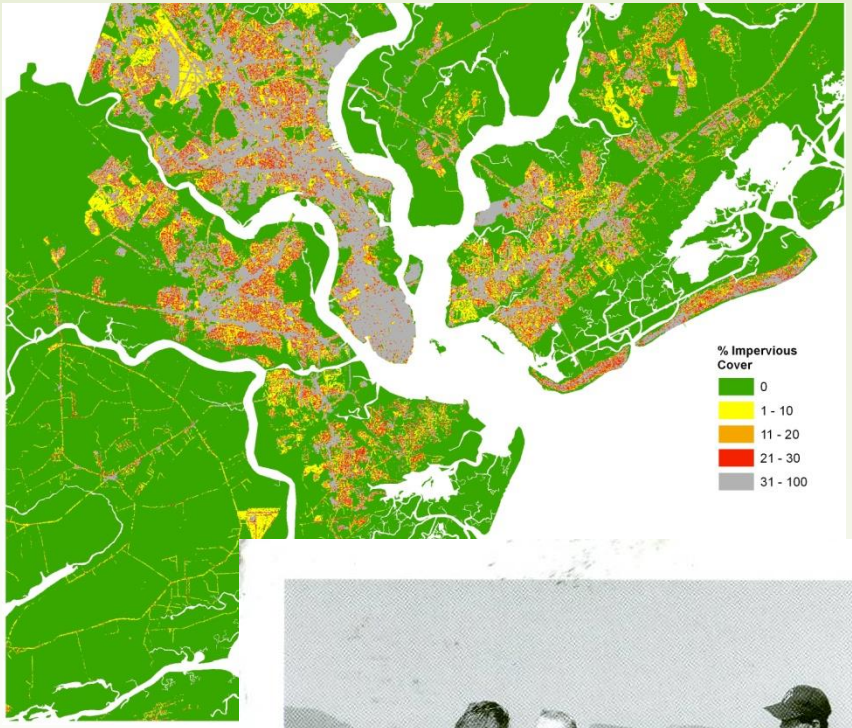
Stressor

Coastal Development Activities

Increases population density

Alters land cover

Increases impervious surface



Land Use Planning in Montana

Watershed landscape has changed over time.

	Population Density	Imperious Cover	Ponds
	1990-2010	1996-2011	1996-2013
All	↑	↑	↑
F	○	○	
FS	↑	↑	
S	↑	↑	
U	○	○	

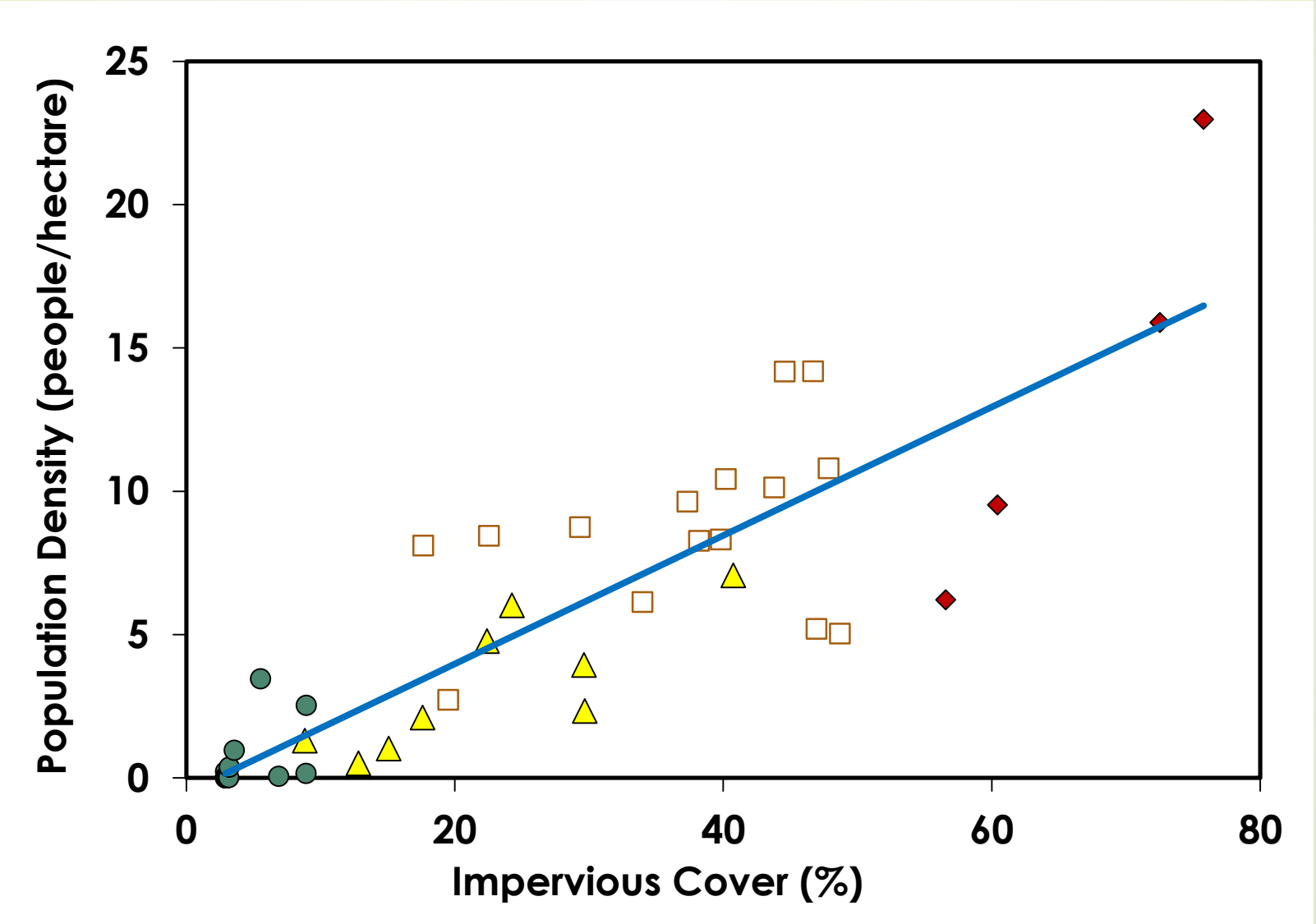
Key

Significant ↑

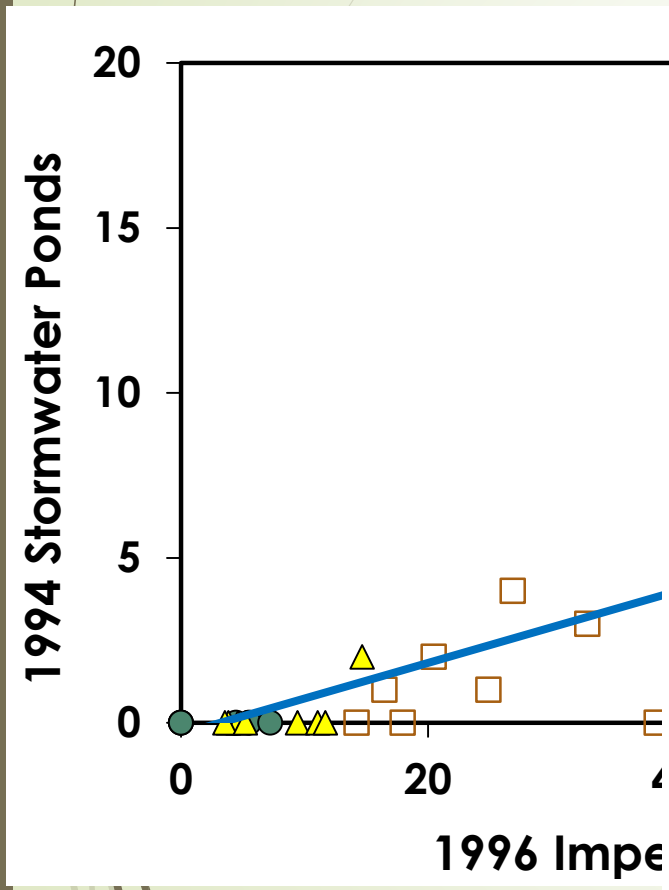
Marginally Significant ⇧

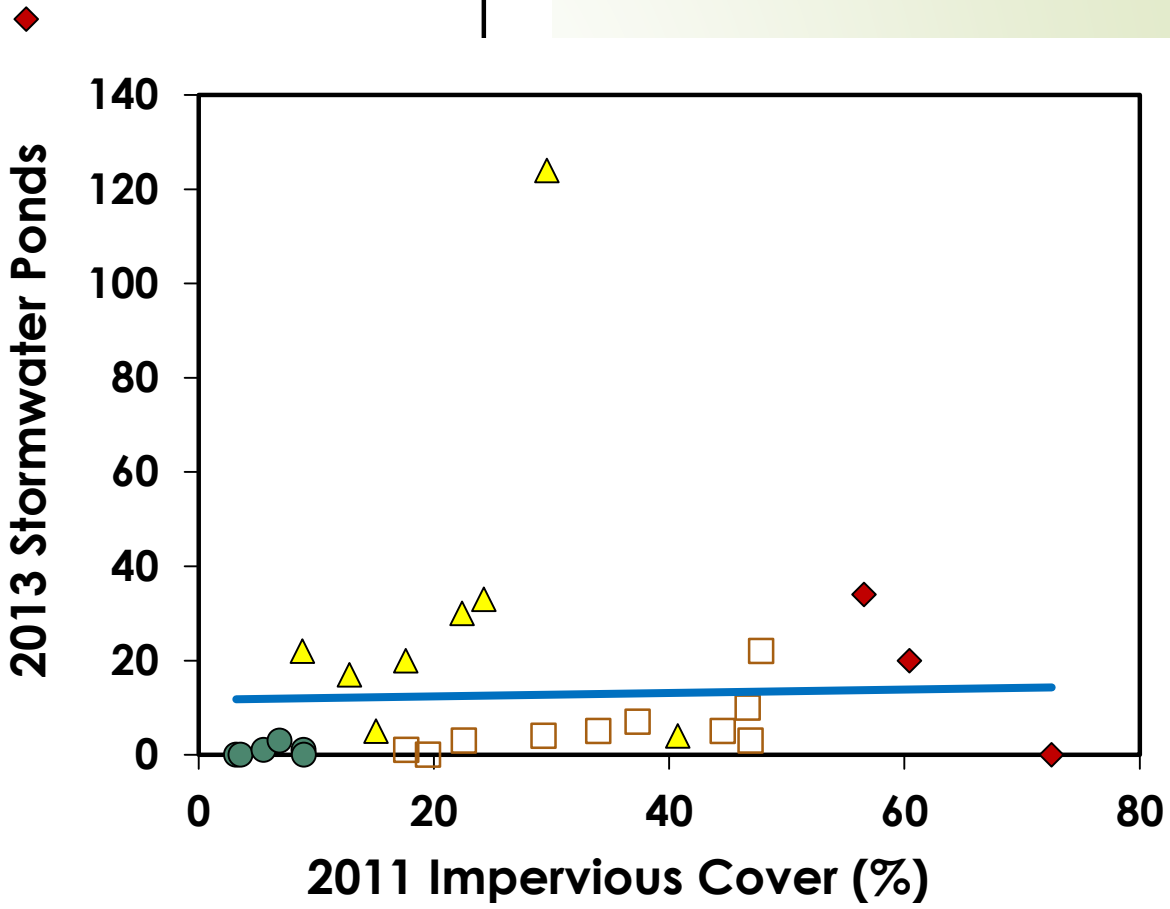
Not significant ○

Impervious cover is related to number of people.



Stormwater ponds have increased in last 20 years.





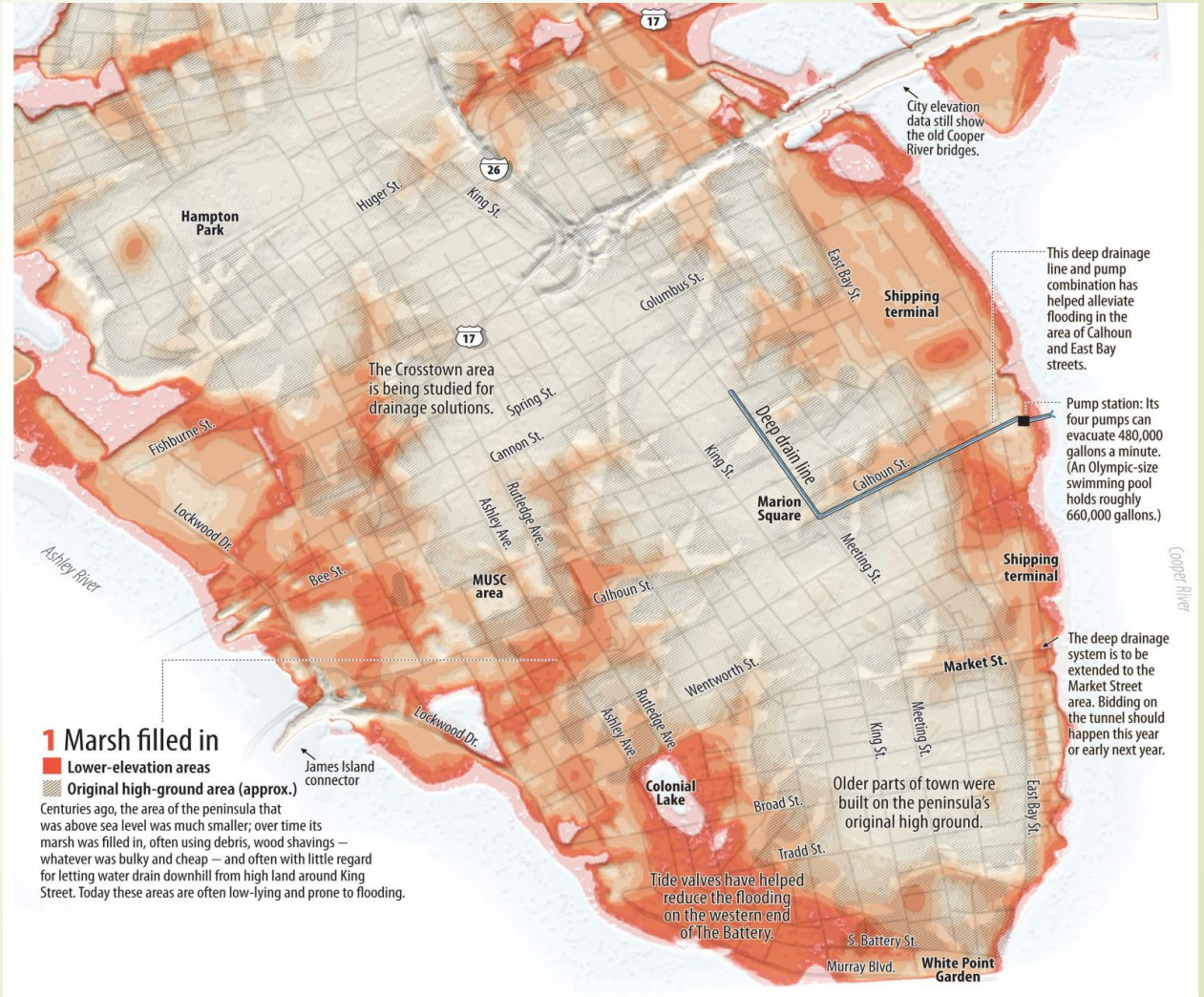
Exposure

Physical-Chemical Changes

Alters water quality and hydrography

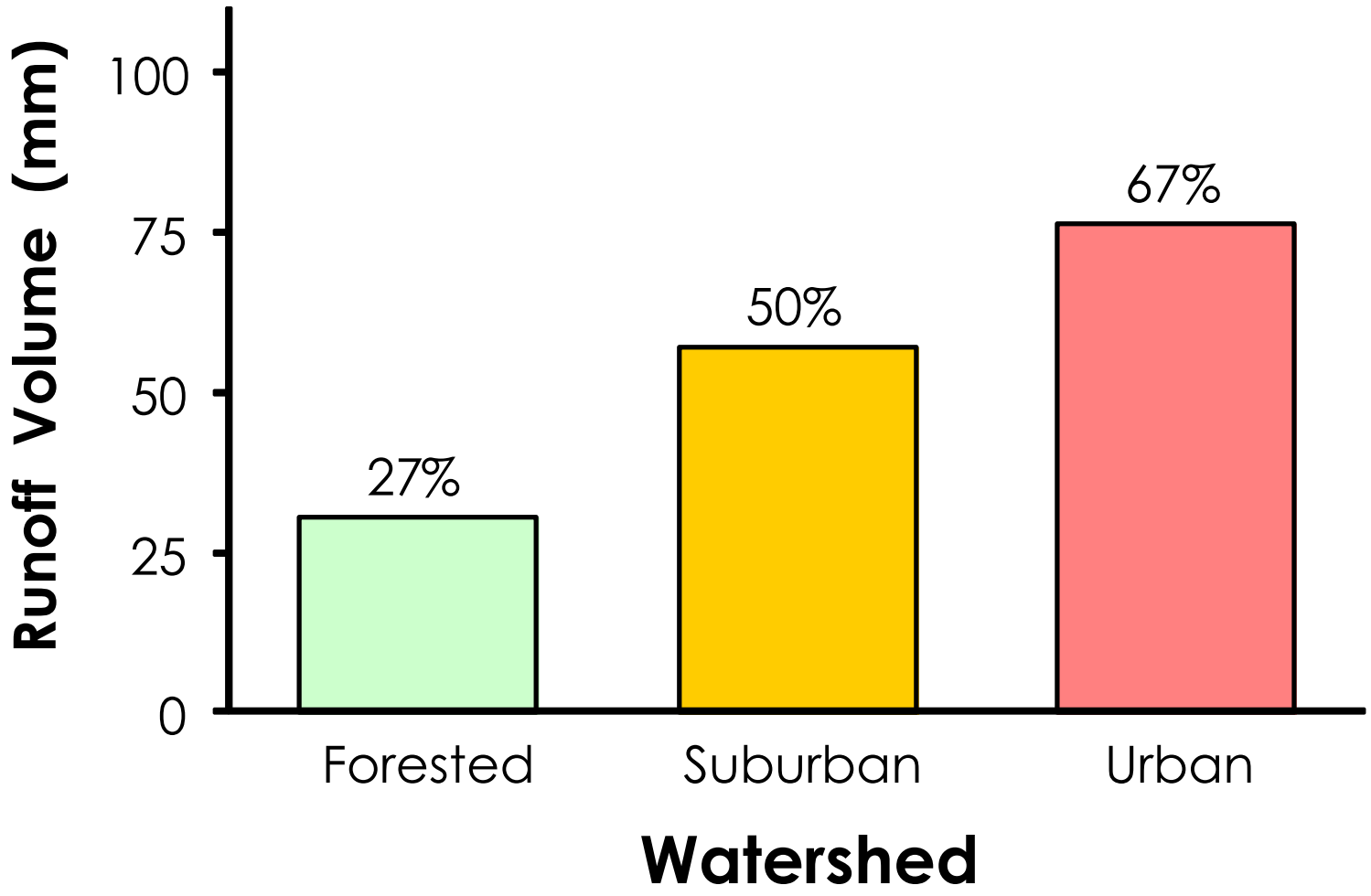
Increases microbial contamination

Increases chemical contamination



Post and Courier

Runoff increases with level of development.



USDA- Natural Resource Conservation Service Calibrated Model
Present scenario – 24-hr 4.5-in storm event, average runoff conditions

1994

Rose Dhu Creek

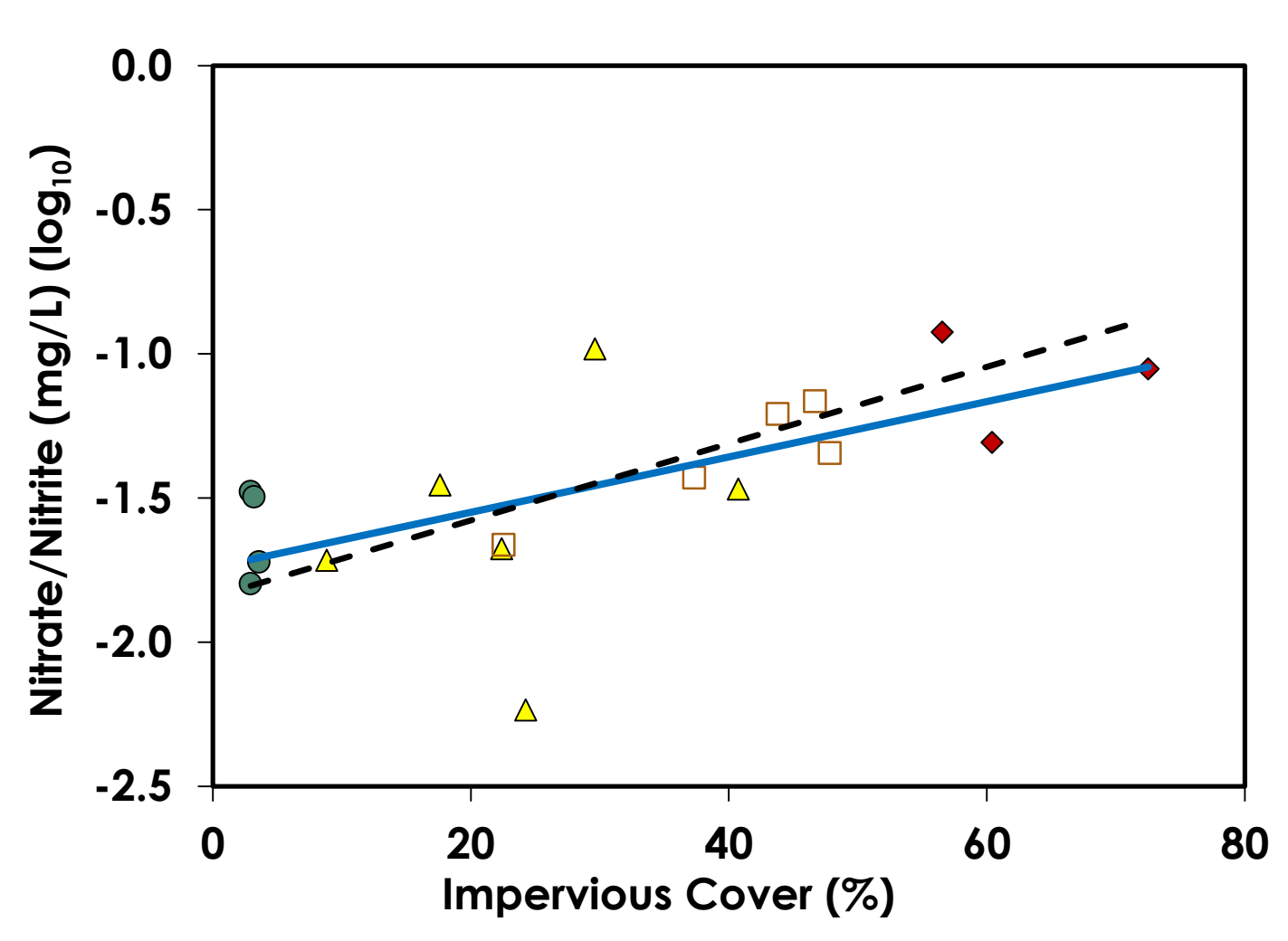
2013

19 Years

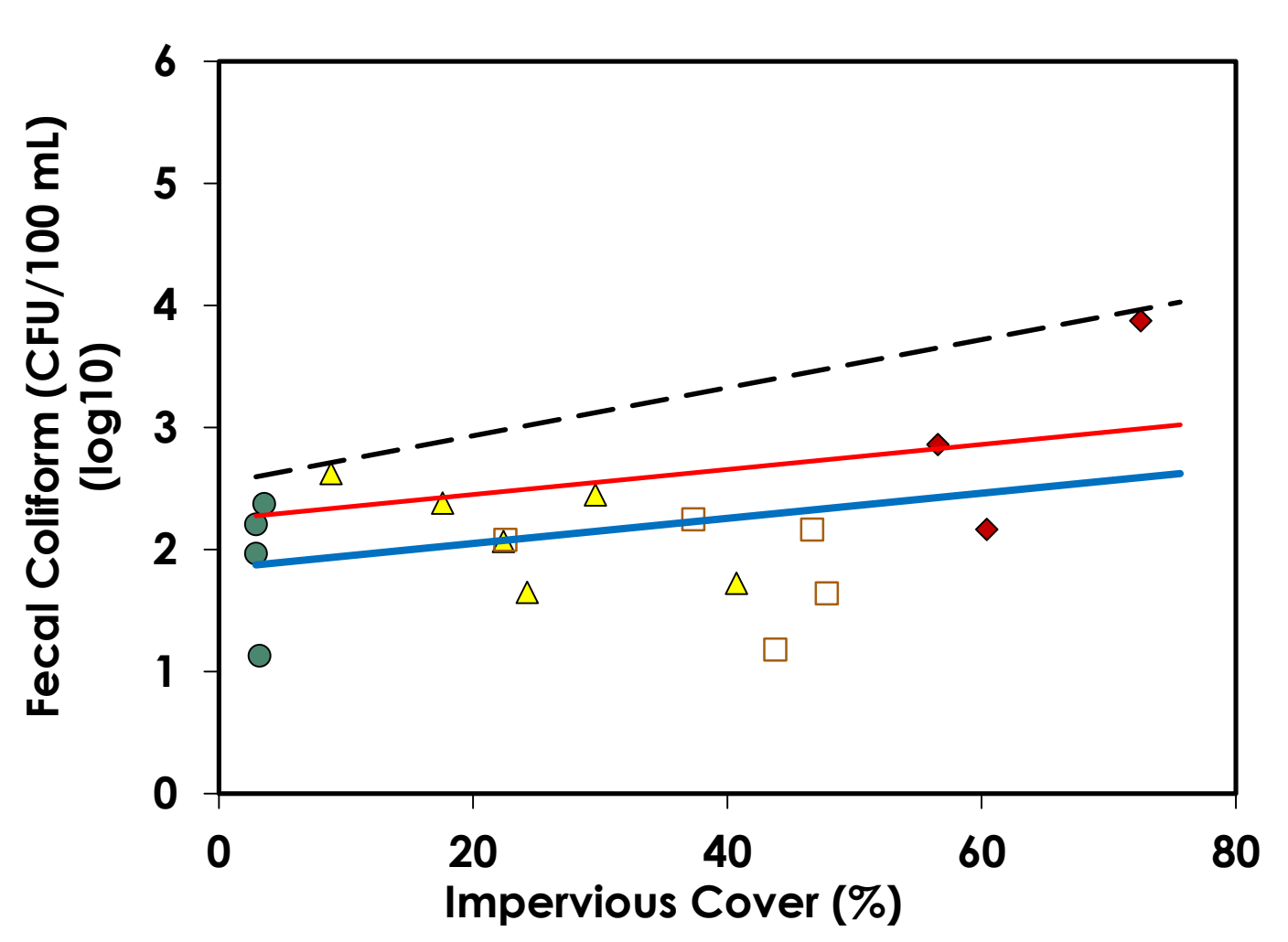
+ 19% IC

+ 30 ponds

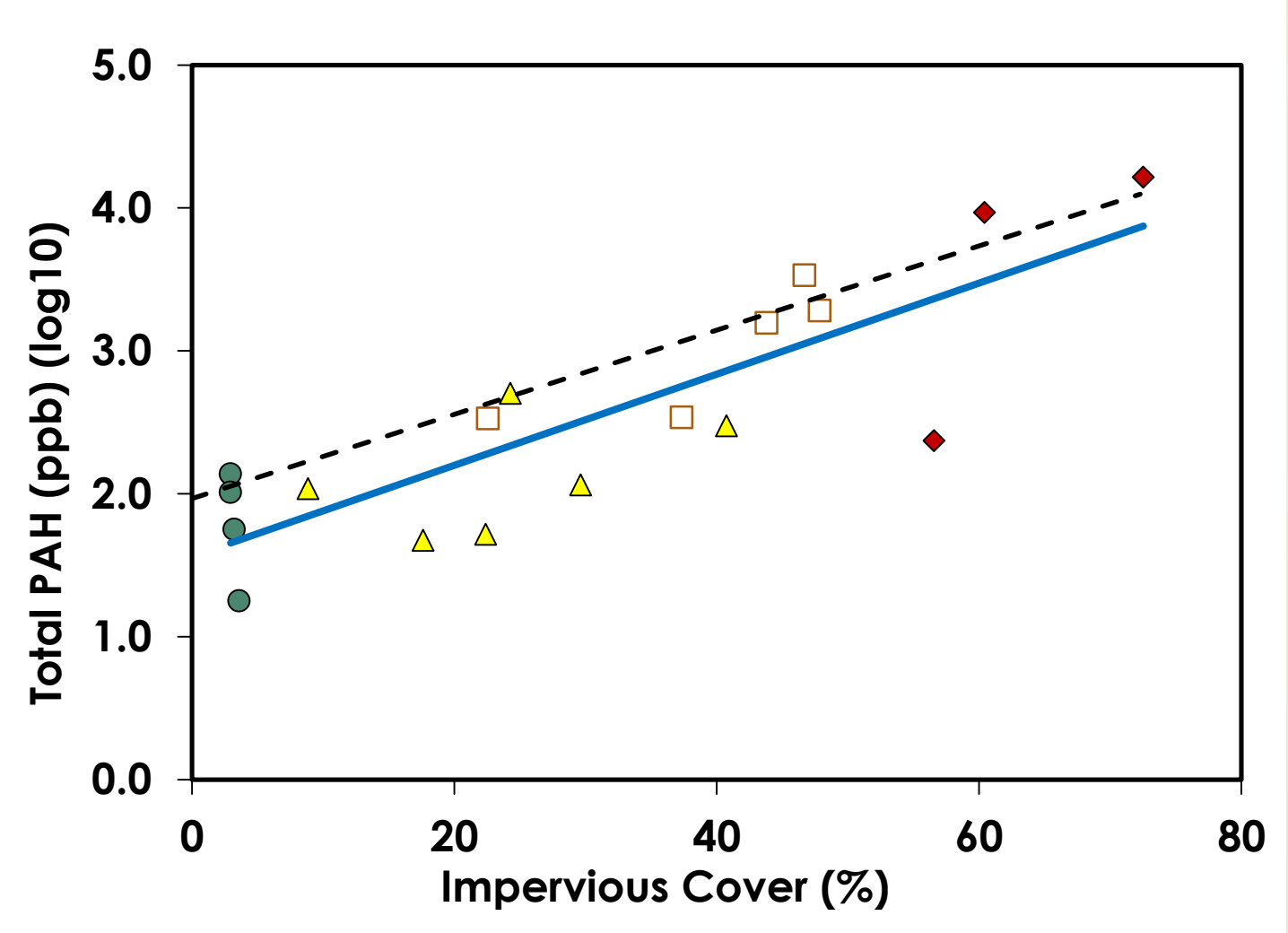
Nitrate/Nitrite concentration has increased in association with increased development.



Fecal pollutants increased in association with increased development, sometimes.



Fossil fuels in sediments increased in association with increased development.



Biological Response

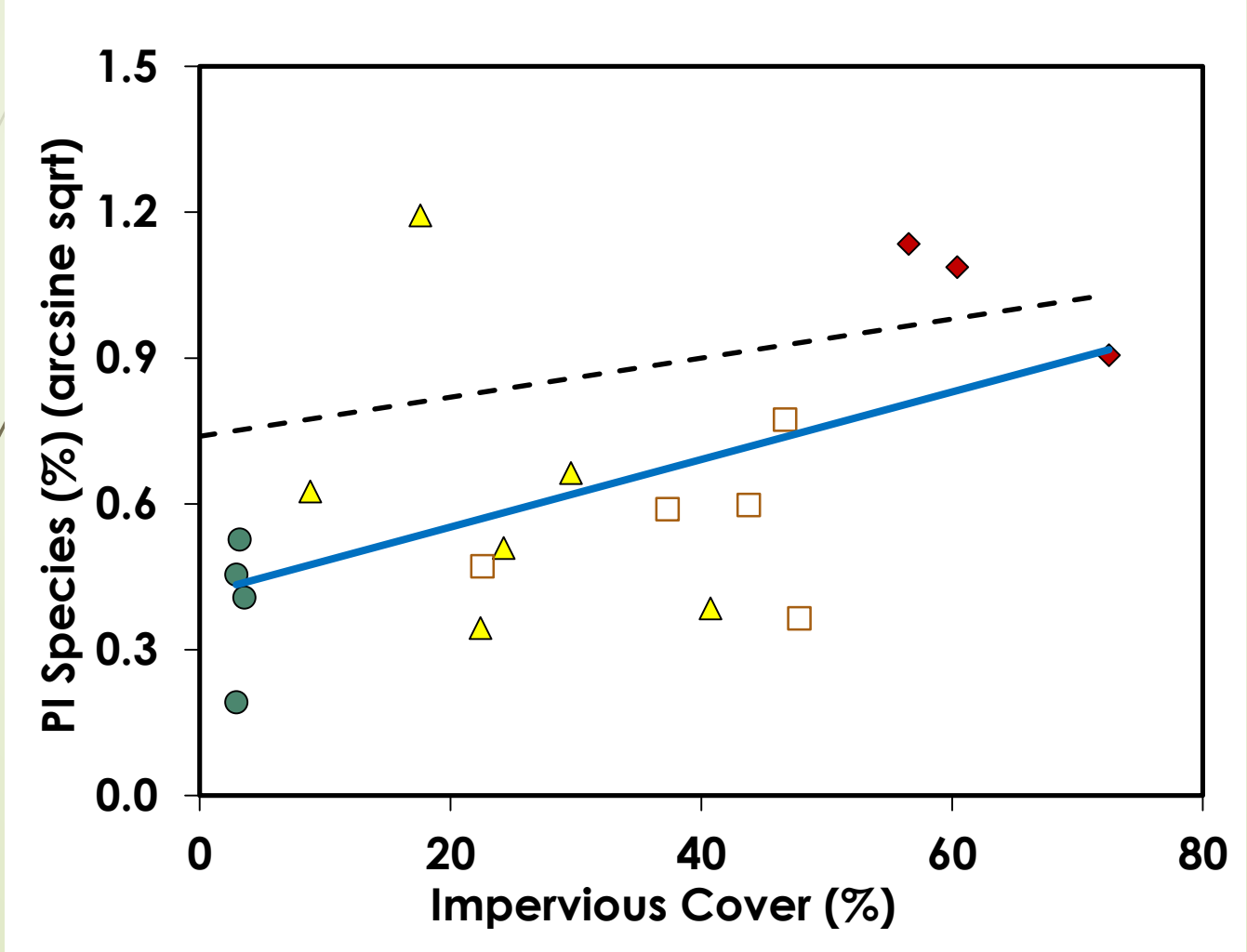
Living Resources Impacts

Reduces biological productivity

Alters food webs

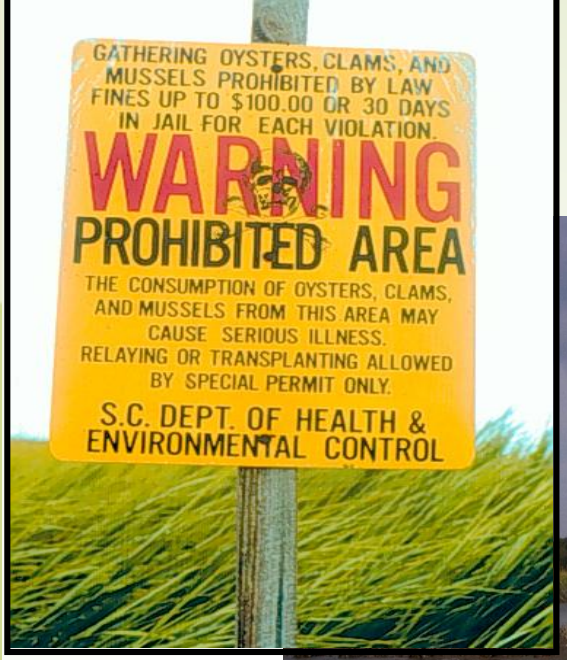
Impairs animal health

Changes in the food web have been observed with increased development.



Societal Response

Health and Well Being



- Increases beach and shellfish bed closures
- Increases flooding
- Increases public health risk and economic impact

Shadowmoss – Post and Courier

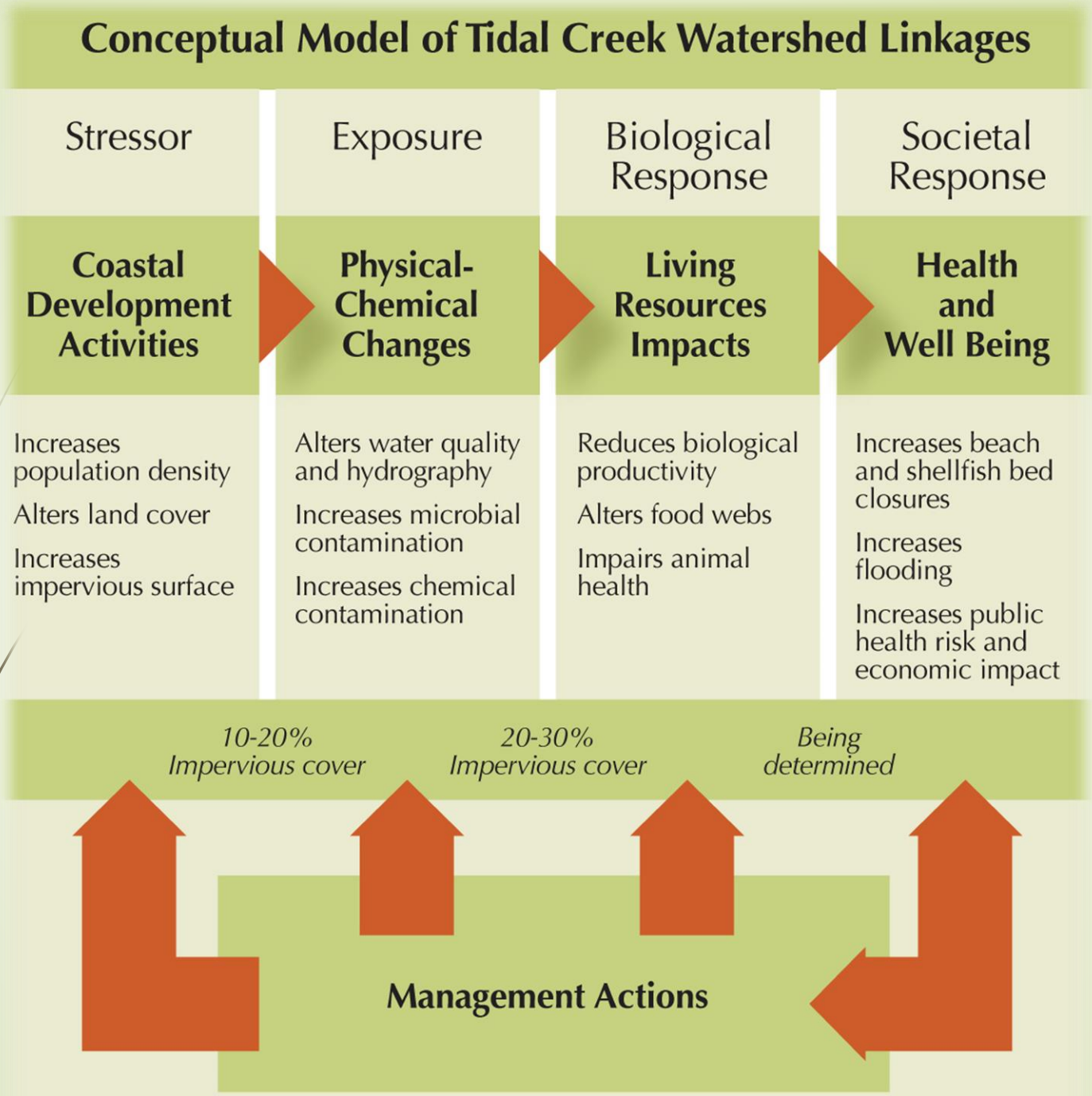
Development about to restart in one of Charleston's most flood-prone regions

BY ABIGAIL DARLINGTON ADARLINGTON@POSTANDCOURIER.COM

SEP 6, 2018

Cynthia and Gregory Martin were rescued from their home in Shadowmoss during 2015 flooding by Charleston Fire and Task Force One. File/Staff

"What led the area down a path of destruction was a combination of mapping errors, rampant development and a profound misunderstanding of how water naturally moves through the basin."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Increases public health risk and economic impact
10-20% Impervious cover
20-30% Impervious cover
Being determined
Management Actions

What can we do about it?

- Plan
- Manage stormwater runoff
- Become stewards of the environment